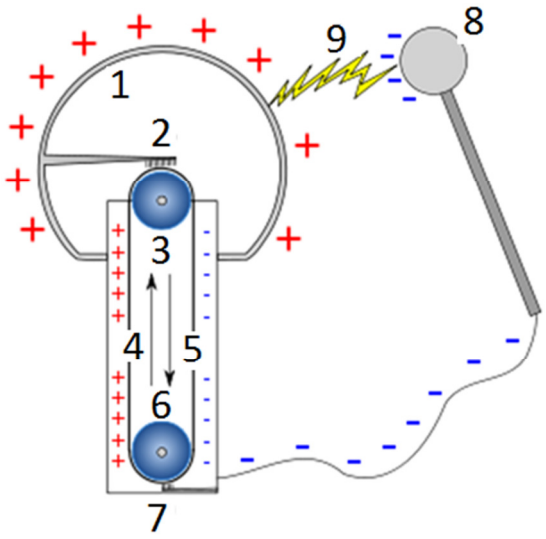
Van de Graff Generator Name_____ Block_____ Date:_____

A Van de Graff generator is an electrostatic generator which uses a moving belt to accumulate very high voltages on a hollow metal globe on the top of the stand. It was invented in 1929 by American physicist Robert J. Van de Graff. The potential differences achieved in modern Van de Graff generators can reach 5 megavolts. The Van de Graff generator can be thought of as a constant-current source connected in parallel with a capacitor and a very large electrical resistance.

A simple Van de Graff-generator consists of a belt of rubber, running over two metal pulleys, one of which is surrounded by a hollow metal sphere. Two electrodes, (2) and (7), in the form of comb-shaped rows of sharp metal points, are positioned respectively near to the bottom of the lower pulley and inside the sphere, over the upper pulley. Comb (2) is connected to the sphere, and comb (7) to the ground. A high DC potential (with respect to earth) is applied to roller (3); a positive potential in this example.



As the belt passes in front of the lower comb, it receives negative charge that escapes from its points due to the influence of the electric field around the lower pulley, which ionizes the air at the points. As the belt touches the upper roller (6), it transfers some electrons, leaving the roller with a negative charge (if it is insulated from the terminal), which added to the negative charge in the belt generates enough electric field to ionize the air at the points of the upper comb. Electrons then leak from the belt to the upper comb and to the terminal, leaving the belt positively charged as it returns down and the terminal negatively charged.

The Spark (Ol' Sparky): Describe what happens:

1. Why doesn't the spark jump any farther than it does? *(Typically no more than 6-8 inches away).*

2. Why does the Van de Graff pause between sparks? (In other words, why isn't there a continuous stream of electricity, rather than a spark?)

3. Does how close you are to the generator affect the spark intensity, size, and frequency?

Hairdo Extraordinaire: Describe what happens:

1. Why does the student's hair stand on end?

2. Where do the electrons (e-) come from?

3. What happens if you don't stand on the wooden boards?

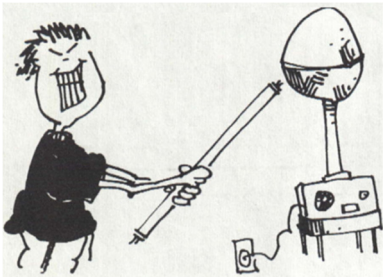
Exploding Paper: Describe what happens:

1. What caused the paper to jump off?

2. What would happen to a whole sheet of paper?

3. What other materials do you think would respond the same way as our confetti?

Lighting the Bulb: Describe what happens:



1. How is light created when the bulb gets shocked?

2. How far does the intensity of the light emitted from the bulb compare with how far away the distance is to the generator?

Human Circuit: Describe what happens:

1. Why was the first person who held on to the generator shocked?

2. Why could you touch the first person anywhere and draw a shock?

3. What happens when the person at the end touched something metal?

Ionic Wind: Describe what happens:

1. How does the Van de Graff generator affect the flame from the lighter?

Punk Generator: Describe what happens:

1. Why are the strips flying in the air?

2. Do you think attaching it with electrical tape (an insulator) would make a difference?

3. Does it work well if you tape it to the side of the generator?